DOCUMENT RESUME

ED 356 763 IR 015 984

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TITLE The Comparative Effects of an Introductory versus a Content-Specific Computer Course for Educators on Computer Anxiety and Stages of Concern.
PUB DATE 92
NOTE 15p.; Paper presented at the Annual Meeting of the American Educational Research Association (San Francisco, CA, April 20-24, 1992).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Attitude Change; Comparative Analysis; *Computer Anxiety; *Computer Assisted Instruction; *Computer Literacy; Computer Science Education; Curriculum Development; Educational Research; Elementary Secondary Education; Higher Education; Inservice Teacher Education; Likert Scales; Preservice Teacher Education; *Student Attitudes

ABSTRACT

In this study, the effects of an introductory computer class versus a content-specific course, computers across the curriculum class were examined for changes in computer anxiety and computer concerns. Computer anxiety was measured with a modified version of the Spielberger Self Evaluation Instrument. To track and compare changes in pre-service and inservice teachers' concerns about computers through the seven stages normally experienced when teachers are introduced to new technology, the Stages of Concern instrument, developed by Hall, Rutherford, and George (1988), was utilized. The population of the study consisted of 20 graduate students enrolled in an introductory computer course and 15 graduate students enrolled in a content-specific course using computers. It was found that both treatments were effective in reducing computer anxiety. Students in the introductory course had significant changes in the informational and management concerns. Although the content-specific groups did experience some changes, there were no significant changes in their educational computing concerns. Both groups gained competency in educational computing and knowledge and confidence in integrating computers with various curricula. (Contains 14 references.) (ALF)

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ED356763

The Comparative Effects of an Introductory Versus a Content-Specific Computer Course for Educators on Computer Anxiety and Stages of Concern

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Abstract

In this study, the effects of an introductory computer class vs. a content-specific, computers across the curriculum class are examined for changes in (a) computer anxiety and (b) computer concerns. Computer anxiety was measured with a modified version of the Spielberger *Self Evaluation Instrument.* To track and compare changes in pre-service and inservice teachers' concerns about computers through the seven stages normally experienced when teachers are introduced to new technology. the Stages of Concern instrument, developed by Hall, Rutherford, and George (1988), was utilized. Both groups reduced their computer anxiety. The introductory class experienced some significant shifts in their Stages of Concern but the content-specific class did not.

Keywords: Computer literacy, computer anxiety, teachers' computer concerns

Review of Literature

Even though computers are an accepted part of educational systems and have proven to be effective across all grade levels and subject matters (Roblyer, Castine & King, 1988), about one third of students entering teacher education programs at a mid-western land grant university reported having no computer experience and only about one fifth reported having experience with computer assisted instruction (CAI)—the least cognitively demanding type of computer use (Liu, Reed & Phillips, 1990). To provide computer-based and computer-assisted instruction to more students, teachers in all content areas must be prepared to integrate computers with their curricula which, in turn, indicates a need for computer literate teachers.

Since the introduction of the microcomputer to education in the early 1970's, the meaning of computer literacy has shifted: An early emphasis on knowing how to program and using drill and practice software (e.g., Kull & Archambault, Jr., 1984) has given way to an emphasis on learning how to use computers as tools for managerial tasks and to assist in teaching specific topics in education (Bozeman & Spuck, 1991; Scheingold, Martin & Endreweit, 1986). The questions usually asked by those charged with preparing teachers to use computers effectively is: "What constitutes computer literacy and how do we help teachers become computer literate?" But perhaps a better question is: "What knowledge do teachers need to effectively utilize the computer in their classroom to help them with the job of teaching and what is the best way to provide that knowledge?" Teachers feel that the most important application of computers for themselves, as well as their students, is as tools to help with administrative tasks or *Computer Managed Instruction* (CMI) first and to help teach content or *Computer Assisted Instruction* (CAI) second (Bozeman & Spuck; Woodrow, 1991).

These two areas of priority can easily be expanded to fit well with the seven ordered concerns identified by Hall, Rutherford and George (1988)—(a) awareness, (b) informational (c) personal, (d) management, (e) consequence, (f) collaboration, and (g) refocusing—that are generally followed when people are introduced to an innovation and which can be measured with their stages of concern instrument. The premise of the instrument is that when introduced to an innovation, people tend to have very self-oriented concerns and, as they learn more, become concerned with how to manage that innovation in their classroom and, finally, begin to explore how they can work with others to share their experiences and learn new ways to use previously learned ideas. The first concern stage is

Awareness: I am not concerned about microcomputers. The second stage is Informational: I am concerned about learning more about microcomputers. The third stage is Personal: I am concerned about how using microcomputers will affect me personally in the classroom. The fourth stage is Management: I am concerned about the time needed to learn about microcomputers. The fifth stage is Consequence: I am concerned about the effects my use of microcomputers will have on my students. The sixth stage is Collaboration: I am concerned about working with others to learn more about microcomputers. The seventh stage is Refocusing: I am concerned about learning new ways to use what I already know about microcomputers.

These progressive priorities can also serve as a model for computer literacy development that suggests educators should (a) become aware of the potential uses of computers, (b) learn to use computers for managerial chores such as word processing, data basing, generating tests and keeping grades electronically (CMI) and (c) to use computers to assist their instructional endeavors (CAI) by integrating drill and practice, tutorials, problem-solving, and simulation packages with their regular classroom activities. Such an approach is similar to the computer literacy program developed and implemented by Marietta College in Ohio for pre-service teachers, which introduces computers to lower-level education majors and continues teaching progressive educational computing throughout the undergraduate career and into graduate classes (Golden, 1991). The Marietta College model involves five components: (a) Acceptance, (b) Understanding, (c) Application, (d) Evaluation, and (e) Design.

An affective phenomenon that must be overcome before educators begin to feel comfortable with computers is computer anxiety. Since computer anxiety is usually thought of as a temporary condition that can be overcome by learning in an environment structured to reduce anxiety (Torris, 1985), the first step to literacy is adequate instruction to overcome that anxiety (teachers often experience more anxiety than their students [Cambre & Cook, 1984]). Å wide variety of exposure times from as little as six hours (Overbaugh & Reed, 1990; Overbaugh & Reed, 1991) to four weeks (Reed & Palumbo, 1987/88) and 60 hours (Honeyman & White, 1987) reduces anxiety. However, overcoming computer anxiety is not the only goal for a literacy course (Woodrow, 1991), but is the first step.

PURPOSE OF STUDY AND RESEARCH QUESTIONS

Given the wide range of components that comprise computer literacy, we designed an investigation which compared the computer anxiety and stages of concerns of educators exposed to two types of computer courses: (a) a general computer course in which there were few explicit attempts to help the student-educators relate computer uses to their content-area teaching and (b) a content-specific course in which the generalities of computer use were used only as a framework and much of the instruction centered on using computers within certain content areas.

We specifically wanted to determine, **"What are the differences in computer anxiety as a result of the two, different exposures."** Perhaps more importantly was the question, **"What are the comparative effects of an introductory versus a content-specific computer course on student-educators' concerns toward computer use?"** We speculated that the content-specific course might be more effective simply because the instruction helped the students see the link between computers and their teaching.

DESIGN OF THE STUDY

Sample

20 graduate students enrolled in an introductory computer course and 15 graduate students enrolled in a content-specific course participated in this study, 10 of whom had had prior computer courses.

Independent Variable

Students enrolled in the 16-week introductory course—Introductory Group—received instruction on the following computer areas: (a) software evaluation; (b) word-processing; (c) data base; (d) spreadsheet; (e) BASIC programming; (f) readings on the effects of computer use on learning in general, writing, and problem-solving; and (g) readings on telecommunications, interactive video, plus a textbook dealing with different types of software. A paper on the integration of computers in a curriculum of their choice was the final assignment.

Students enrolled in the 16-week content-specific course—Content-Specific Group—received instruction on the following areas: (a) test-generators and grade book programs; (b) computers and writing; (c) computers and literature; (d) computers and biology; (e) computers and mathematics; (f) computer literacy; (g) computer science; (h) computers in elementary grade levels; (i) computers in

business education; (j) computers and social studies; and (k) computers and physical education. In addition to having weekly readings on one of the topics above, each student served as a primary developer of a curriculum in which he or she taught as well as serving as a secondary developer of a curriculum in another area. The basic premise of the class was that they should become sufficiently versed in the uses of computers in a wide range of content-areas in order to serve as a computer resource person for their school or college.

Dependent Measures

Computer anxiety. A modified version of Spielberger's *Self-Evaluation Questionnaire* was used to measure computer anxiety. The original anxiety assessment instrument, a 20 question, Likert-scale (four-point) instrument designed to reflect how respondents feel, was reworded to address the domain of computer anxiety. For example, the item "I feel tense" was changed to read: "I feel tense when I work with a computer." The modified version has been used extensively (i.e., Reed& Palumbo, 1987/1988, 1991) and has proved to be very reliable (coefficient alpha = .91 and .93 respectively) as well as valid.

Stages of concern. This 35-item Likert-scale (eight-point) instrument, discussed above, contains seven clusters of five items each. Each grouping reflects one of the seven concerns identified by Hall, Rutherford, and George (1977): Awareness, Informational, Personal, Management, Consequence, Collaboration, and Refocusing. Respondents indicate their level of agreement or disagreement with statements such as: "I am concerned about the time needed to learn about the microcomputer that will keep me away from doing what I am supposed to be doing as part of my job" by circling a number from 0 (Not true of me now) to 7 (Very true of me now).

Analysis of the Data

Unpaired t-Tests were conducted to determine whether computer anxiety and the different stages of concerns differed between groups (Introductory Group versus Content-Specific Group) and within groups (pre-treatment versus post-treatment).

RESULTS

Computer Anxiety

Computer anxiety decreased from pre-treatment to post-treatment for the Introductory Group: $t(19) = 5.58$, $p = .0001$. Computer anxiety also decreased for the Content-Specific Group: $t(14) =$

2.59, p = .02. Although the computer anxiety of the students in the introductory course was significantly higher than those in the content-specific course at the pre-treatment point, their computer anxiety at the post-treatment point was not significantly different. (See Table 1.)

Table 1.

Computer Anxiety of Students Enrolled in Either a Computer Introductory Course or a Content-Specific Computer Course

	Pre-Treatment	*Post-Treatment*
Introductory	*46.8*	*38.05*
Content-Specific	*37.13*	*33.3*

Stages of Concern

Within groups. Those students in the Introductory Group significantly reduced their Informational and Management Concerns but did not significantly change any of the other five concerns. The Content-Specific Group did not significantly change any of their concerns. (See Table 2.)

Between groups. At either the pre-treatment or post-treatment points, the introductory class and the content-specific class did not differ significantly at the following stages: Informational, Personal, Management, and Refocusing. There was a significant difference between the pre-treatment scores at the Awareness stage—with the Introductory Group having higher Awareness scores but not at the post-treament point. There were significant pre-treatment and post-treatment scores between the two groups at the Consequence and Collaboration stages—with the content-specific class students having greater concerns.

Table 2.

Stages of Concern Pre-Treatment and Post-Treatment Scores of Students Enrolled in Either an Introductory or Content-Specific Computer Course

	Awareness	*Informational*	*Personal*	*Management*	*Consequence*	*Collaboration*	*Refocusing*
INTRODUCTORY							
Pre-Treat.	6.1[1]	26.8[2]	22.95	20.45[2]	24.4[1]	24.35[1]	25.45
Post-Treat.	4.75	22.4[2]	21.15	14.85[2]	25.8[3]	25.00[3]	28.15
CONTENT-SPECIFIC							
Pre-Treat.	2.87[1]	25.8	25.07	18.20	28.33[1]	29.27[1]	28.40
Post-Treat.	2.87	23.67	25.00	18.47	29.67[3]	30.67[3]	30.1

1 = significant difference between pre-treatment mean of Introductory group and pre-treatment mean of Content-Specific Group within a specific Concern
2 = significant difference between pre-treatment mean and post-treatment mean of Introductory group with a specific Concern
3 = significant difference between post-treatment mean of Introductory group and post-treatment mean of Content-Specific Group within a specific Concern

DISCUSSION

Computer Anxiety

The reduction in computer anxiety for both groups indicates that either course content was effective at reducing computer anxiety or that the length of treatment was adequate. The fact that the Introductory Group had significantly higher anxiety than the Content-Specific Group at the pre-treatment point but not at the post-treatment point indicates that even though general computer instruction is effective at reducing computer anxiety the length of the treatment may have been the significant factor in anxiety reduction.

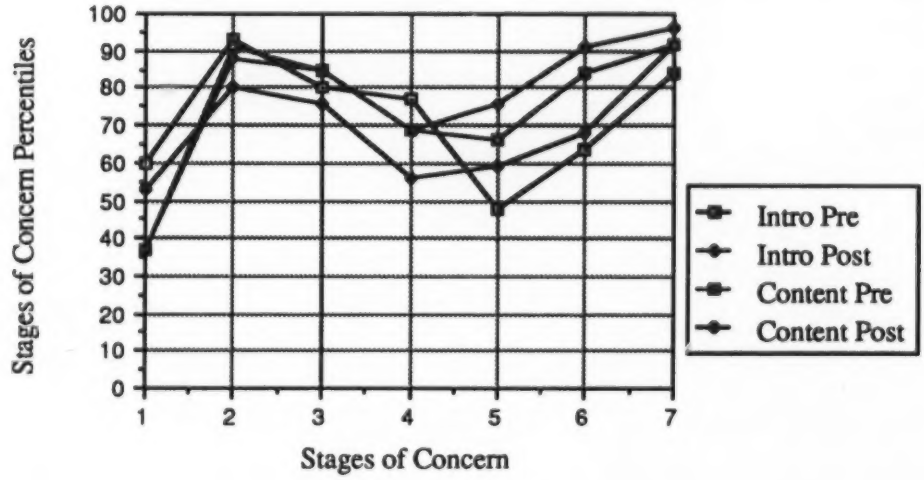
Stages of Concern

The Introductory Group. The Introductory Group experienced greater changes in concerns toward computers than the Content-Specific Group (see Figure 1 and Table 2). They

decreased their Awareness concerns (SOC-1) from pre- to post-treatment sufficiently so that the significant difference between the two groups that existed at the pre-treatment point diminished by the end of the instruction. The Introductory Group also experienced significant pre- to post-treatment decreases at the Informational (SOC-2) and Management (SOC-4) stages (see Figure 2). These changes indicate that the instruction helped them accommodate concerns they had toward accumulating more information about computer use as well as determining how they would find the time to learn more about computer use. The changes experienced by the Introductory Group are consistent with findings in other studies involving educators who are computer novices.

Figure 1.

Stages of Concern Pre- to Post-treatment for Introductory and Content-Specific Groups[1]



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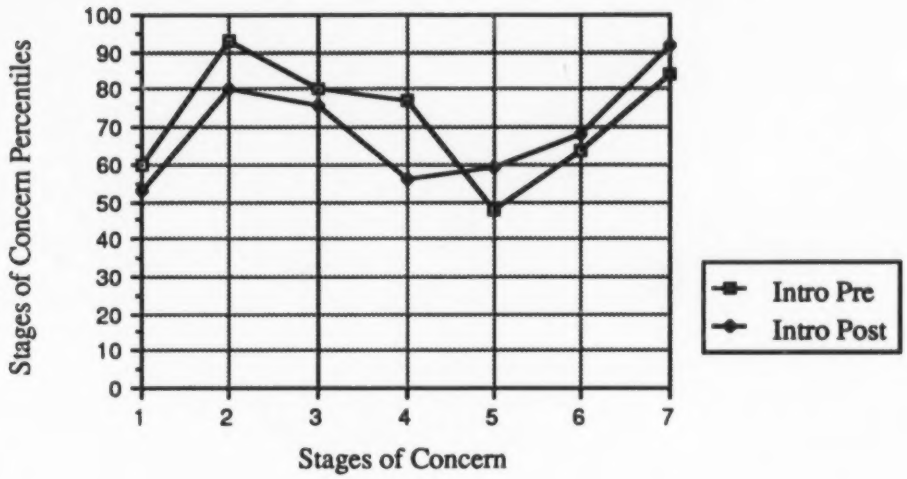
[1] SOC scores in Figures 1, 2, and 3 have been changed to percentiles as suggested by and according to specifications developed by Hall, Rutherford, and George.

Figure 2.

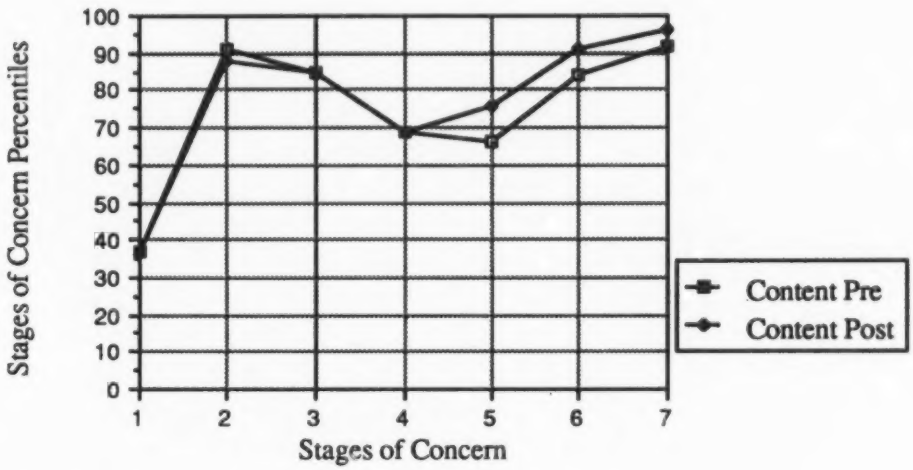
Stages of Concern Pre- to Post-treatment for the Introductory Group



The Content-Specific Group. The Content-Specific Group did not experience any significant changes from pre-treatment to post-treatment (see Figure 3). They did, however, maintain greater Consequence (SOC-5) and Collaboration (SOC-6) concerns than the Introductory group (see Figure 1). They had significantly greater concerns at these two stages at both the pre-treatment and post-treatment levels than the Introductory group. This maintenance indicates that their course provided additional information on how computer use might affect their students as well as on collaborating with fellow teachers on computer use. The maintenance of the Collaborative concern, especially, makes sense because the major framework of this class was for them to develop into computer resource people so that they could assist other teachers with implementing computers—or, to collaborate with other teachers in a leadership role. That they did not experience any pre- to post-treatment changes may have been due to their having to view their role as a computer resource person; rather than just acquiring information for their own use, they needed to acquire sufficient expertise to help others teaching in content-areas other than their own.

Figure 3.

Stages of Concern Pre- to Post-treatment for the Content-Specific Group



Another explanation for the lack of many significant findings is that, aside from the Introductory Group's reduction in the second and fourth stages, Informational and Management Concerns, both treatment groups knew enough about the potential uses of computers that engaging in a course to actually learn about how to use computers in their profession did not significantly change many of their pre-treatment concerns. This argument is supported by both groups' low scores on their Awareness Concerns, which indicates they were already aware of potential educational uses of computers. Additional support for this argument lies in the relatively high concern scores on all other stages by both treatment groups (See Figure 1), which again indicates that the sample began the treatment with high concerns in middle and upper end of the Stages of Concern continuum.

SUMMARY

This study was designed to investigate the differential effects two different educational computing courses, intended to raise the educational computing literacy levels of educators, would have on (a) the levels of computer anxiety experienced by the sample and (b) the shift in concerns about educational computing as measured by the Hall, Rutherford, and George (1977) stages of

concern instrument. Both treatments were effective in reducing computer anxiety. The Introductory Group experienced, to some extent, the shift in concerns normally expected when a group is exposed to and learns about an innovation, with significant changes in their Informational and Management Concerns. On the other hand, although the Content-Specific Group did experience some changes (See Figure 3), there were no significant changes in their educational computing concerns. Both groups, however, gained competency in educational computing and will be more knowledgeable and confident when they begin integrating computers with various curricula.

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